

**Lasertoodete ohutus. Osa 1: Seadmete  
klassifikatsioon, nõuded ja  
kasutusjuhised**

Safety of laser products -- Part 1: Equipment  
classification and requirements

## EESTI STANDARDI EESSÕNA

## NATIONAL FOREWORD

<p>Käesolev Eesti standard EVS-EN 60825-1:2007 sisaldab Euroopa standardi EN 60825-1:2007 ingliskeelset teksti.</p> <p>Käesolev dokument on jõustatud 23.11.2007 ja selle kohta on avaldatud teade Eesti standardiorganisatsiooni ametlikus väljaandes.</p> <p>Standard on kättesaadav Eesti standardiorganisatsioonist.</p>	<p>This Estonian standard EVS-EN 60825-1:2007 consists of the English text of the European standard EN 60825-1:2007.</p> <p>This document is endorsed on 23.11.2007 with the notification being published in the official publication of the Estonian national standardisation organisation.</p> <p>The standard is available from Estonian standardisation organisation.</p>
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<p><b>Käsitlusala:</b> IEC 60825-1 is applicable to safety of laser products emitting laser radiation in the wavelength range 180 nm to 1 mm. A laser product may consist of a single laser with or without a separate power supply or may incorporate one or more lasers in a complex optical, electrical, or mechanical system. Typically, laser products are used for demonstration of physical and optical phenomena, materials processing, data reading and storage, transmission and display of information, etc. Such systems have found use in industry, business, entertainment, research, education, medicine and consumer products. Laser products that are sold to other manufacturers for use as components of any system for subsequent sale are not subject to IEC 60825-1, since the final product will itself be subject to this standard. However, if the laser system within the laser product is operable when removed from the equipment, the requirements of this Part 1 apply to the removable unit. NOTE 1 Operable equipment does not require a tool to prepare for operation. Any laser product is exempt from all further requirements of this Part 1 if classification by the manufacturer of that product according to Clauses 3, 8 and 9 shows that the emission level does not exceed the AEL (accessible emission limit) of Class 1 under all conditions of operation, maintenance, service and failure. NOTE 2 The above exemption is to ensure that inherently safe laser products are not unnecessarily subject to the standard.</p>	<p><b>Scope:</b> IEC 60825-1 is applicable to safety of laser products emitting laser radiation in the wavelength range 180 nm to 1 mm. A laser product may consist of a single laser with or without a separate power supply or may incorporate one or more lasers in a complex optical, electrical, or mechanical system. Typically, laser products are used for demonstration of physical and optical phenomena, materials processing, data reading and storage, transmission and display of information, etc. Such systems have found use in industry, business, entertainment, research, education, medicine and consumer products. Laser products that are sold to other manufacturers for use as components of any system for subsequent sale are not subject to IEC 60825-1, since the final product will itself be subject to this standard. However, if the laser system within the laser product is operable when removed from the equipment, the requirements of this Part 1 apply to the removable unit. NOTE 1 Operable equipment does not require a tool to prepare for operation. Any laser product is exempt from all further requirements of this Part 1 if classification by the manufacturer of that product according to Clauses 3, 8 and 9 shows that the emission level does not exceed the AEL (accessible emission limit) of Class 1 under all conditions of operation, maintenance, service and failure. NOTE 2 The above exemption is to ensure that inherently safe laser products are not unnecessarily subject to the standard.</p>
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ICS 13.110, 31.260

**Võtmesõnad:** equipment classification, laser products, radiation safety, requirements, user's guide

Eesti Standardikeskusele kuulub standardite reprodutseerimis- ja levitamiseõigus

English version

**Safety of laser products -  
Part 1: Equipment classification and requirements  
(IEC 60825-1:2007)**

Sécurité des appareils à laser -  
Partie 1: Classification des matériels  
et exigences  
(CEI 60825-1:2007)

Sicherheit von Lasereinrichtungen -  
Teil 1: Klassifizierung von Anlagen  
und Anforderungen  
(IEC 60825-1:2007)

This European Standard was approved by CENELEC on 2007-09-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

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European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

**Central Secretariat: rue de Stassart 35, B - 1050 Brussels**

## Foreword

The text of document 76/338/CDV, future edition 2 of IEC 60825-1, prepared by IEC TC 76, Optical radiation safety and laser equipment, was submitted to the IEC-CENELEC parallel Unique Acceptance Procedure and was approved by CENELEC as EN 60825-1 on 2007-09-01.

This European Standard partially supersedes EN 60825-1:1994 (+ corrigendum February 1995) + A1:2002 + A2:2001 (+ corrigendum April 2004).

The user's guide has been removed from this part of the EN 60825 series and is now a separate document (Part 14). Light emitting diodes (LEDs) have been removed from the scope of this part of EN 60825, but may still be included in other parts.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2008-06-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2010-09-01

Annex ZA has been added by CENELEC.

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## Endorsement notice

The text of the International Standard IEC 60825-1:2007 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60027-1	NOTE	Harmonized as EN 60027-1:2006 (not modified).
IEC 60065	NOTE	Harmonized as EN 60065:2002 (modified).
IEC 60079	NOTE	Harmonized in EN 60079 series (partially modified).
IEC 60079-0	NOTE	Harmonized as EN 60079-0:2004 (not modified).
IEC 60204-1	NOTE	Harmonized as EN 60204-1:2006 (modified).
IEC 60825-2	NOTE	Harmonized as EN 60825-2:2004 (not modified).
IEC 60825-4	NOTE	Harmonized as EN 60825-4:2006 (not modified).
IEC 60825-12	NOTE	Harmonized as EN 60825-12:2004 (not modified).
IEC 60950	NOTE	Harmonized in EN 60950 series (modified).
IEC 61040	NOTE	Harmonized as EN 61040:1992 (not modified).
IEC 61508	NOTE	Harmonized in EN 61508 series (not modified).
IEC 62115	NOTE	Harmonized as EN 62115:2005 (modified).
ISO 11146-1	NOTE	Harmonized as EN ISO 11146-1:2005 (not modified).
ISO 11553-1	NOTE	Harmonized as EN ISO 11553-1:2005 (not modified).
ISO 12100-1	NOTE	Harmonized as EN ISO 12100-1:2003 (not modified).
ISO 12100-2	NOTE	Harmonized as EN ISO 12100-2:2003 (not modified).
ISO 13694	NOTE	Harmonized as EN ISO 13694:2000 (not modified).

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**Annex ZA**  
(normative)

**Normative references to international publications  
with their corresponding European publications**

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60050-845	1987	International Electrotechnical Vocabulary (IEV) - Chapter 845: Lighting	–	–
IEC 60601-2-22	– <sup>1)</sup>	Medical electrical equipment - Part 2: Particular requirements for the safety of diagnostic and therapeutic laser equipment	EN 60601-2-22	1996 <sup>2)</sup>
IEC 61010-1	– <sup>1)</sup>	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements	EN 61010-1 + corr. June	2001 <sup>3)</sup> 2002

<sup>1)</sup> Undated reference.

<sup>2)</sup> Valid edition at date of issue. EN 60601-2-22:1996 will be superseded by EN 60601-2-22:200X, which is based on IEC 60601-2-22:2007.

<sup>3)</sup> Valid edition at date of issue.

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

GROUP SAFETY PUBLICATION  
PUBLICATION GROUPEE DE SÉCURITÉ

**Safety of laser products –  
Part 1: Equipment classification and requirements**

**Sécurité des appareils à laser –  
Partie 1: Classification des matériels et exigences**



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# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

GROUP SAFETY PUBLICATION  
PUBLICATION GROUPEE DE SÉCURITÉ

**Safety of laser products –  
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## CONTENTS

FOREWORD.....	5
1 Scope and object.....	7
2 Normative references .....	9
3 Terms and definitions .....	9
4 Engineering specifications.....	22
4.1 General remarks.....	22
4.2 Protective housing.....	22
4.3 Access panels and safety interlocks .....	22
4.4 Remote interlock connector .....	23
4.5 Manual reset .....	23
4.6 Key control.....	24
4.7 Laser radiation emission warning .....	24
4.8 Beam stop or attenuator.....	24
4.9 Controls .....	24
4.10 Viewing optics .....	24
4.11 Scanning safeguard.....	25
4.12 "Walk-in" access .....	25
4.13 Environmental conditions .....	25
4.14 Protection against other hazards.....	25
5 Labelling .....	26
5.1 General.....	26
5.2 Class 1 and Class 1M.....	28
5.3 Class 2 and Class 2M.....	29
5.4 Class 3R .....	30
5.5 Class 3B .....	30
5.6 Class 4.....	30
5.7 Aperture label.....	30
5.8 Radiation output and standards information.....	30
5.9 Labels for access panels .....	31
5.10 Warning for invisible laser radiation.....	32
5.11 Warning for visible laser radiation .....	32
6 Other informational requirements .....	32
6.1 Information for the user .....	32
6.2 Purchasing and servicing information .....	34
7 Additional requirements for specific laser products .....	34
7.1 Other parts of the standard series IEC 60825.....	34
7.2 Medical laser products .....	35
7.3 Laser processing machines .....	35
7.4 Electric toys .....	35
7.5 Consumer electronic products .....	35
8 Classification.....	35
8.1 Introduction .....	35
8.2 Classification responsibilities.....	36
8.3 Classification rules .....	36

9	Determination of the accessible emission level.....	40
9.1	Tests.....	40
9.2	Measurement of laser radiation .....	41
9.3	Measurement geometry.....	51
	Annex A (informative) Maximum permissible exposure values.....	57
	Annex B (informative) Examples of calculations .....	64
	Annex C (informative) Description of the classes and potentially associated hazards.....	74
	Annex D (informative) Biophysical considerations .....	80
	Annex E (informative) MPEs and AELs expressed as radiance .....	90
	Annex F (informative) Summary tables .....	94
	Annex G (informative) Overview of associated parts of IEC 60825.....	97
	Bibliography.....	99
	Figure 1 – Warning label – Hazard symbol.....	27
	Figure 2 – Explanatory label .....	28
	Figure 3 – Measurement set-up to limit angle of acceptance by imaging the apparent source onto the plane of the field stop .....	53
	Figure 4 – Measurement set-up to limit angle of acceptance by placing a circular aperture or a mask (serving as field stop) close to the apparent source .....	54
	Figure 5 – Experimental set-up for the determination of the accessible emission (above) and the angular subtense of the apparent source (below) for condition 2 when an extended source is to be considered (i.e. not using the default, simplified evaluation).....	55
	Figure B.1 – Flowchart guide for the classification of laser products from supplied output parameters.....	66
	Figure B.2 – Flowchart guide for the classification of Class 1M and Class 2M laser products .....	68
	Figure B.3 – AEL for Class 1 ultra-violet laser products for selected emission durations from $10^{-9}$ s to $10^3$ s .....	69
	Figure B.4 – AEL for Class 1 ultra-violet laser products for emission durations from $10^{-9}$ s to $10^3$ s at selected wavelengths.....	69
	Figure B.5 – AEL for Class 1 visible and selected infra-red laser products (case $C_6 = 1$ ) .....	70
	Figure D.1 – Anatomy of the eye.....	80
	Figure D.2 – Diagram of laser-induced damage in biological systems .....	82
	Figure E.1 – Radiance as a function of wavelength.....	90

Table 1 – Requirements for safety interlocking .....	23
Table 2 – Additivity of effects on eye and skin of radiation of different spectral regions.....	37
Table 3 – Times below which pulse groups are summed .....	40
Table 4 – Accessible emission limits for Class 1 and Class 1M laser products and $C_6 = 1$ .....	44
Table 5 – Accessible emission limits for Class 1 laser products in the wavelength range from 400 nm to 1 400 nm (retinal hazard region): extended sources .....	45
Table 6 – Accessible emission limits for Class 2 and Class 2M laser products .....	46
Table 7 – Accessible emission limits for Class 3R laser products and $C_6 = 1$ .....	47
Table 8 – Accessible emission limits for Class 3R laser products in the wavelength range from 400 nm to 1 400 nm (retinal hazard region): extended sources .....	48
Table 9 – Accessible emission limits for Class 3B laser products .....	49
Table 10 – Correction factors and breakpoints for use in AEL and MPE evaluations .....	50
Table 11 – Measurement aperture diameters and measurement distances for the default (simplified) evaluation .....	52
Table 12 – Reference points .....	52
Table 13 – Limiting angle of acceptance $\gamma_{ph}$ .....	55
Table A.1 – Maximum permissible exposure (MPE) for $C_6 = 1$ at the cornea for exposure to laser radiation.....	58
Table A.2 – Maximum permissible exposure (MPE) at the cornea for exposure to laser radiation from extended sources in the wavelength range from 400 nm to 1 400 nm (retinal hazard region) .....	59
Table A.3 – Maximum permissible exposure (MPE) of the skin to laser radiation.....	60
Table A.4 – Aperture diameters for measuring laser irradiance and radiant exposure .....	60
Table D.1 – Summary of pathological effects associated with excessive exposure to light .....	84
Table D.2 – Explanation of measurement apertures applied to the MPEs.....	88
Table E.1 – Maximum radiance of a diffused source for Class 1.....	91
Table F.1 – Summary of the physical quantities used in this Part 1 .....	94
Table F.2 – Summary of manufacturer's requirements .....	95
Table G.1 – Overview of additional data in associated parts of IEC 60825 .....	98

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## SAFETY OF LASER PRODUCTS –

## Part 1: Equipment classification and requirements

## FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 60825-1 has been prepared by IEC technical committee 76: Optical radiation safety and laser equipment.

This second edition of IEC 60825-1 cancels and replaces the first edition published in 1993, its Amendment 1 (1997) and its Amendment 2 (2001). It constitutes a technical revision. The user's guide has been removed from this part of the IEC 60825 series and is now a separate document (Part 14). Light emitting diodes (LEDs) have been removed from the scope of this part of IEC 60825, but may still be included in other parts.

This part of IEC 60825 has the status of a Group Safety Publication, in accordance with IEC Guide 104<sup>1)</sup>, for aspects of laser radiation pertaining to human safety.

The text of this standard is based on the following documents:

CDV	Report on voting
76/338/CDV	76/357/RVC

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The list of all parts of the IEC 60825 series, published under the title *Safety of laser products*, can be found on the IEC website.

This part of IEC 60825 is also referred to as "Part 1" in this publication.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

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1) IEC Guide 104:1997, *The preparation of safety publications and the use of basic safety publications and group safety publications*  
It gives guidance to IEC technical committees and to writers of specifications concerning the manner in which safety publications should be drafted.  
This guide does not constitute a normative reference and reference to it is given for information only.

## SAFETY OF LASER PRODUCTS –

### Part 1: Equipment classification and requirements

#### 1 Scope and object

IEC 60825-1 is applicable to safety of laser products emitting laser radiation in the wavelength range 180 nm to 1 mm.

A laser product may consist of a single laser with or without a separate power supply or may incorporate one or more lasers in a complex optical, electrical, or mechanical system. Typically, laser products are used for demonstration of physical and optical phenomena, materials processing, data reading and storage, transmission and display of information, etc. Such systems have found use in industry, business, entertainment, research, education, medicine and consumer products.

Laser products that are sold to other manufacturers for use as components of any system for subsequent sale are not subject to IEC 60825-1, since the final product will itself be subject to this standard. However, if the laser system within the laser product is operable when removed from the equipment, the requirements of this Part 1 apply to the removable unit.

NOTE 1 Operable equipment does not require a tool to prepare for operation.

Any laser product is exempt from all further requirements of this Part 1 if classification by the manufacturer of that product according to Clauses 3, 8 and 9 shows that the emission level does not exceed the AEL (accessible emission limit) of Class 1 under all conditions of operation, maintenance, service and failure.

NOTE 2 The above exemption is to ensure that inherently safe laser products are not unnecessarily subject to the standard.

In addition to the hazards resulting from laser radiation, laser equipment may also give rise to other hazards such as fire and electric shock.

NOTE 3 However, the classification and other requirements of this standard are intended to address only the laser radiation hazards to the eyes and skin. Other hazards are not included within its scope.

This Part 1 describes the minimum requirements. Compliance with this Part 1 may not be sufficient to achieve the required level of product safety. Laser products must conform to the applicable performance and testing requirements of the applicable product safety standards.

NOTE 4 Other standards may contain additional requirements. Consideration should also be given to the intended application and user group. For example, a class 3B or class 4 laser product may not be suitable for use as a consumer product.

Where a laser system forms a part of equipment which is subject to another IEC product safety standard (e.g. for medical equipment (IEC 60601-2-22), IT equipment (IEC 60950), audio and video equipment (IEC 60065), equipment for use in hazardous atmospheres (IEC 60079), or electric toys (IEC 62115)), this Part 1 will apply in accordance with the provisions of IEC Guide 104<sup>2)</sup> for hazards resulting from laser radiation. If no product safety standard is applicable, then IEC 61010-1 applies.

In previous editions, LEDs were included in the scope of IEC 60825-1, and they may be still included in other parts of the IEC 60825 series. However, with the development of lamp safety standards, optical radiation safety of LEDs in general can be more appropriately addressed by lamp safety standards. The removal of LEDs from the scope of this Part 1 does not preclude other standards from including LEDs whenever they refer to lasers. CIE S009 may be applied to determine the risk group class of an LED or product incorporating one or more LEDs.

The MPE (maximum permissible exposure) values of this Part 1 were developed for laser radiation and do not apply to collateral radiation. However, if a concern exists that accessible collateral radiation might be hazardous, the laser MPE values may be applied to conservatively evaluate this potential hazard.

The MPE values are not applicable to intentional human exposure to laser radiation for the purpose of medical or cosmetic/aesthetic treatment.

NOTE 5 Annexes A to H have been included for purposes of general guidance and to illustrate many typical cases. However, the annexes are not regarded as definitive or exhaustive and reference should always be made to the appropriate clause(s) in the normative part of this document.

The objectives of this part of IEC 60825 are the following:

- to introduce a system of classification of lasers and laser products according to their degree of optical radiation hazard in order to aid hazard evaluation and to aid the determination of user control measures;
- to establish requirements for the manufacturer to supply information so that proper precautions can be adopted;
- to ensure, through labels and instructions, adequate warning to individuals of hazards associated with accessible radiation from laser products;
- to reduce the possibility of injury by minimizing unnecessary accessible radiation and to give improved control of the laser radiation hazards through protective features.

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<sup>2)</sup> IEC Guide 104:1997, *The preparation of safety publications and the use of basic safety publications and group safety publications*

## 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050-845:1987, *International Electrotechnical Vocabulary (IEV) – Chapter 845: Lighting*

IEC 60601-2-22, *Medical electrical equipment – Part 2: Particular requirements for the safety of diagnostic and therapeutic laser equipment*

IEC 61010-1, *Safety requirements for electrical equipment for measurement, control, and laboratory use – Part 1: General requirements*

## 3 Terms and definitions

For the purposes of this document, the definitions of IEC 60050-845 as well as the following apply.

NOTE For convenience here, the definitions have been arranged in English alphabetical order. Departures from IEC 60050-845 are intentional and are indicated. In such cases, reference is made, between brackets, to the definition of Part 845 of IEC 60050, with the mention “modified”.

### 3.1

#### **access panel**

part of the protective housing or enclosure which provides access to laser radiation when removed or displaced

### 3.2

#### **accessible emission**

level of radiation determined at a position and with aperture stops (when the AEL is given in units of Watts or Joules) or limiting apertures (when the AEL is given in units of  $W \cdot m^{-2}$  or  $J \cdot m^{-2}$ ) as described in Clause 9

The accessible emission is determined where human access is considered, as specified in Definition 3.37. The accessible emission is compared with the accessible emission limit (Definition 3.3) in order to determine the class of the laser product. In the body of the standard, whenever the term “emission level” is used, it is to be understood as accessible emission.

NOTE When the beam diameter is larger than the aperture stop, the accessible emission when given in units of Watts or Joules is less than the total emitted power or energy of the laser product. When the beam diameter is smaller than the diameter of the limiting aperture, the accessible emission when given in units of  $W \cdot m^{-2}$  or  $J \cdot m^{-2}$ , i.e. as irradiance or radiant exposure averaged over the limiting aperture, is smaller than the actual irradiance or radiant exposure of the beam. See also aperture stop (3.9) and limiting aperture (3.52).

### 3.3

#### **accessible emission limit**

##### **AEL**

the maximum accessible emission permitted within a particular class

NOTE Wherever the text refers to “emission level not exceeding the AEL” or similar wording, it is implicit that the accessible emission is determined following the measurement criteria specified in Clause 9.